

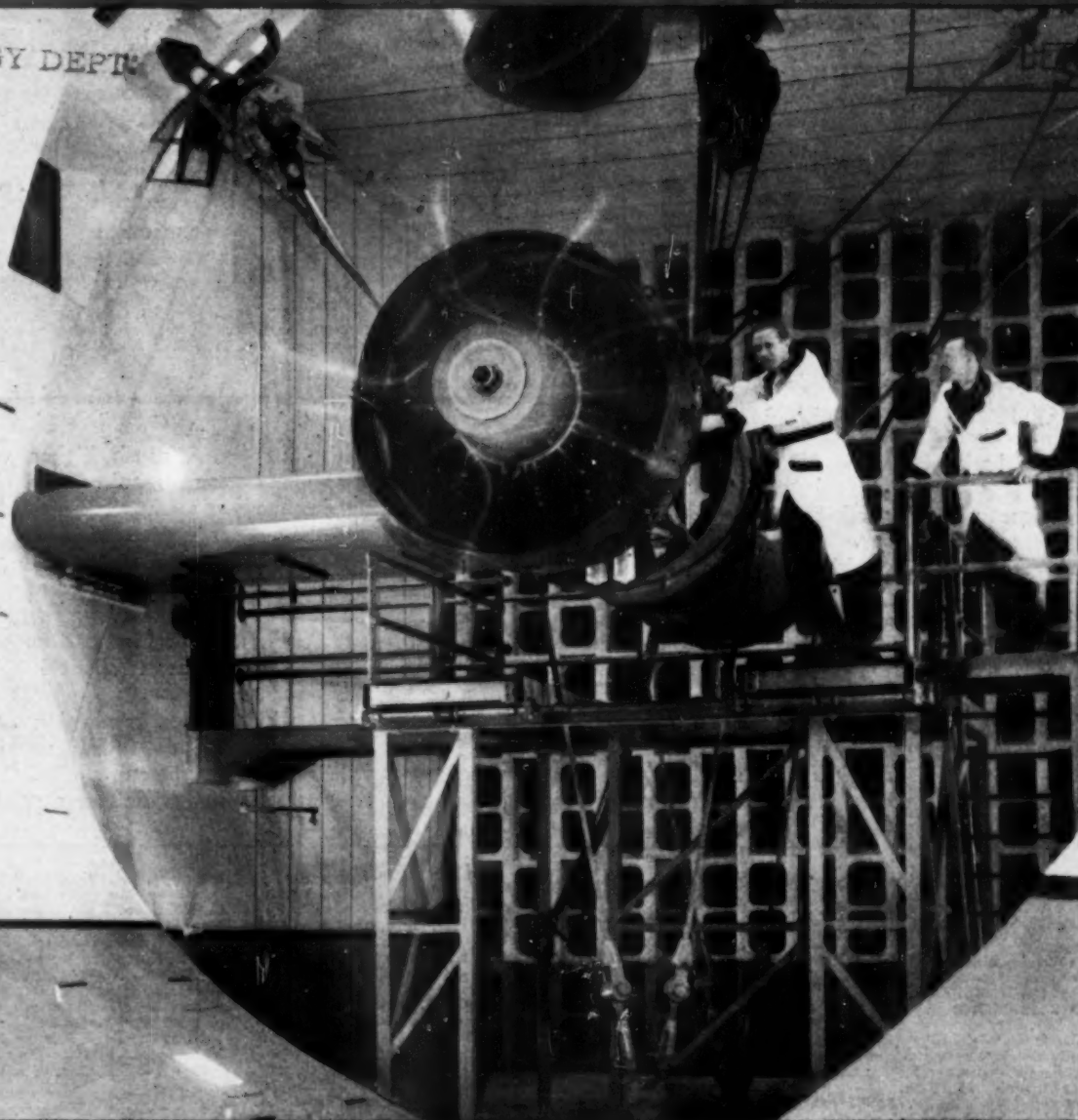
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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE • OCTOBER 24, 1942

TECHNOLOGY DEPT.



Engine Research

See Page 270

A SCIENCE SERVICE PUBLICATION

Do You Know?

There is more *vitamin C* in canned tomatoes than in canned tomato juice.

A new paint now used for camouflage, similar to casein paint, is made from *soy-bean* protein.

The mount for a 5-inch *anti-aircraft gun* weighs about 24 tons, contains 2,700 different parts.

All the *bombs* dropped on London in the last war could be carried in one flight by seven of today's heavy bombers.

More trapping of rabbits is urged by the government not only to protect farm crops but to supply *felt* for hat manufacturers.

Enough *rayon* to make 13 dozen pairs of stockings goes into the recoil mechanism of one 37-mm. gun as packing to make it airtight..

Lac insects, which produce the world's supply of shellac from tree gum, look like small, purple beads strung along the bark of a twig.

The Bureau of Standards now has an instrument, called a Photoelectric Tristimulus *Colorimeter*, which can distinguish 100,000,000 shades of color, mostly invisible to the naked eye.

The average 10,000-ton merchant ship requires approximately a quarter of a million pounds of *copper* and its alloys; while a single battleship such as the U.S.S. Washington, requires two million pounds of copper and its alloys.

Question Box

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ENGINEERING

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INVENTION

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PHYSICS

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Where have jet-propelled planes been developed? p. 267.

MATHEMATICS

How does the size of sand grains affect the amount of oil the sand can hold? p. 271.

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MEDICINE

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Why is it dangerous to lose the cilia in your bronchial tubes? p. 260.

NUTRITION

What strange foods may be substituted for beefsteak if times are hard enough? p. 259.

ORNITHOLOGY

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PSYCHIATRY

How is the Army preventing mental illness among the troops? p. 263.

PUBLIC HEALTH

How does the health of the Army compare with that during the World War? p. 268.

To foil Nazi bombs, one British *war factory* may be scattered over as many as 42 separate regions, taking in five counties.

Out of every seven and a half dozen *eggs* produced in the U. S. this year, at least one dozen will be dried to supply Lend-Lease needs.

The new definition for *morale*, by Australian soldiers in New Guinea, is "what makes your legs do what your head reckons impossible."

A much higher vitamin A content than required for U.S.P. codliver oil as recently been found in the Uruguayan fish, *pescadilla* or hake.

Fuel oil consumption varies almost exactly with the weather; if a winter is 10% warmer, consumption in each burner is about 10% less.

New production methods now permit use of Indian wood (spruce) in the manufacture of *airplanes*, thus increasing India's war production.

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MEDICINE

Polio Virus Isolated

Crystals of a chemical, protein in nature, may be agent causing infantile paralysis. If so, first step in obtaining a successful vaccine may be accomplished.

► A FIRST STEP in attempts to produce a successful vaccine for protecting against infantile paralysis may have been taken in research reported by Dr. E. Racker, formerly of Anderson Institute and the University of Minnesota and now at Harlem Hospital, New York (*Science*, Oct. 16).

Dr. Racker has obtained crystals of a chemical, protein in nature, which might be the infantile paralysis virus. The crystalline protein material was obtained from the brains of mice infected with infantile paralysis. When injected into brains of other mice, the protein crystals produced typical paralytic symptoms of the disease in 14 to 72 hours.

"As encouraging as these data are," Dr. Racker emphasizes, "It must be stressed that there is no evidence and no claim that the crystalline material obtained by this procedure represents the poliomyelitis virus. The possibility that the virus is adsorbed on the protein cannot be excluded."

Whether or not the crystals are the virus, the method of obtaining the material may give scientists a means of getting a more highly purified virus than they have had before. Purification of the infantile paralysis virus has been one of the great aims of scientists fighting this disease. The goal has been hard to reach because the infantile paralysis virus is one of the two smallest viruses known.

With a pure or highly purified, that is, nearly pure virus, scientists could do many more experiments looking for ways of controlling the disease, because they could inoculate more or cheaper animals than monkeys. And they might be able to develop a successful vaccine because with pure virus they could make the vaccine potent enough to be effective. Virus-containing material available at present has so little virus in it in relation to other things that the amount which can safely be given does not contain enough virus to be effective.

Science News Letter, October 24, 1942

NUTRITION

Insects Replace Steak?

► ANT EGGS, grasshoppers, crickets and snails might serve very well as nourishing substitutes for beefsteak, Dr. Russell M. Wilder and Thomas E. Keys, of the Mayo Clinic, suggest (*Journal, American Medical Association*, Oct. 17).

Dr. Wilder does not suggest that we immediately start eating these particular foods. With the gigantic problem of feeding hundreds of millions of starving people after the war in mind, however, he and Mr. Keys, reference librarian at the Mayo Clinic, have dug into the records to find all the things that might nourish man and have in the past, although now overlooked or scorned as food.

The Bushmen consider termite eggs appetizing, and the records show that both crickets and grasshoppers were eaten by Indians of our western plains when other food supplies ran out. A large white grub found in the pith of palm trees serves as food in the West

Indies and is said to taste, when toasted, like roasted chestnuts.

We may not be driven to eating quite such strange foods, but we should, Dr. Wilder urges, follow the example of primitive man in eating the organ meats as well as the muscle. This means liver, kidneys, brain and the like instead of merely steaks, chops and roasts.

"The dog food manufactured by American packers," he declares, "containing much of what they designate as offals, is demonstrably superior in nutritive value to most of the meat they can for human food."

"Milk tops all lists of foods of high nutritious qualities, but wasteful practice enormously restricts its use for human food," Dr. Wilder states.

Look for whey-cola as a between meals thirst quencher and pick-up, if carbonated beverage manufacturers follow his advice. Whey, left when cheese is made contains some of the protein, some



FOR FUTURE FLEETS—These African mahogany trees are growing very well in Florida where they are catching up on the pines in the foreground which are twice their age.

See page 263.

of the minerals and most of the vitamins of milk. None of it should be thrown away, Dr. Wilder declares, adding that in Germany no milk products may be thrown away and they may not even be used for feed without license.

We should grow more oats, Dr. Wilder urges. They can grow much farther north than wheat and are somewhat more nourishing. Guava, an unfamiliar fruit, has a high vitamin C content and it also should be cultivated more extensively. Soybeans, peanuts and lentils are other nourishing foods that have until recently been neglected.

Mistakes of famine sufferers after the last war which we must avoid today are turning to grass as a food and trying to make flour go farther by adding bran, chaff and straw.

"Grass serves poorly as human food," Dr. Wilder states. His comment on adding bran to flour is that "Nutrients diluted with large amounts of indigestible material are lost; they cannot be absorbed effectively."

Science News Letter, October 24, 1942

MEDICINE

Bald Bronchial Tubes Fatal

Hair-like projections normally present in the tube lining can easily remove secretions but change in lining allows suffocating accumulations.

► CAUSE of death in asthma and some kinds of pneumonia is a metamorphosis of the lining of the bronchial tubes which makes them bald instead of hairy. This discovery was announced by Dr. A. C. Hilding, of Duluth, Minn., at the meeting of the American Academy of Ophthalmology and Otolaryngology, in Chicago.

The hair-like projections, called cilia, normally present in the lining of the bronchial tubes, can readily and easily remove mucous secretions. But in the cases Dr. Hilding studied, the lining of the tubes had changed into another kind of tissue which had no cilia. Consequently the thick mucous substance accumulated in the tubes and the patients died of asphyxiation.

Aggravating the difficulty is the fact that the changed and bald cells themselves produce a secretion which they only partly extrude. This fuses with the general mass of secretion but remains anchored to the cells lining the bronchial tubes, thus aggravating the difficulty of emptying the bronchial tract.

"The ciliary mechanism," Dr. Hilding reported, "is also more or less completely incapacitated in bronchopneumonia, bronchiectasis, and influenzal pneumonia. In 12 fatal cases of the latter which were reviewed, almost every vestige of ciliated epithelium (bronchial tube lining) had been destroyed. Loss of function is doubtless an important factor in the progress of these diseases."

Science News Letter, October 24, 1942

"Smoker's Cough" Is Real

► THE PHRASE "smoker's cough" is no idle expression but a real disturbance of certain body functions, Dr. Marvin F. Jones of New York declared at the meeting of the American Academy of Ophthalmology and Otolaryngology in Chicago.

Best remedy for the condition, Dr. Jones indicated, is six weeks without tobacco.

Smoker's cough is a result of the effect of nicotine on the autonomic nervous system.

"Vital functions are controlled by this largely known and little understood inter-related network of nerves," Dr. Jones said.

Besides digestion, circulation of the blood and the body's heat regulating apparatus, the secretions of the nose, pharynx, trachea and bronchi are under the influence of this set of nerves. The nerves in turn are influenced by drugs, disease, glandular dysfunction, debilitation, injury, physical changes and emotional unbalance. Such influences on the nerves may cause stimulation, depression or paralysis of function.

Cigarette smoking was cited by Dr. Jones as an example of drug action. Cigarettes have a greater effect than cigars or pipes because inhaling increases the contact with the mucous surface through which the nicotine is absorbed.

"The phrase 'smoker's cough' is no idle expression," Dr. Jones declared. "The dry reflex cough and the thick tenacious post-nasal morning collection can definitely be improved by an elimination of tobacco for six weeks. This does not mean sinus treatments and local medications may not give similar relief, but the patients are more apt to stay cured. There are also other causes for the same symptoms so, here, as in all medicine, the cure is only effective if the diagnosis is correct."

Science News Letter, October 24, 1942

Helmets Protect Ears

► DEEP HELMETS, which shield the outer opening to the ear are probably the best means of protecting the ears of the infantryman from explosion damage, Dr. H. G. Perlman, of Chicago, stated at the meeting of the American Academy of Ophthalmology and Otolaryngology in Chicago.

The new style U. S. Army helmets and also those worn by Nazi soldiers are of this type.

Damage to the ear, including deafness, rupture of the ear drum and bleeding from the ear, results from the shock pulse started by an explosion from gunfire or bombs. Dr. Perlman defined a shock

pulse as "a sound wave of great condensation and great initial velocity."

"War is literally fought with these shock pulses," he declared.

The ear may be protected from the shock pulse by closing it with the finger or by an ear plug as well as by a covering helmet. In the excitement of battle, men are apt to forget to close their ears with their fingers, and ear plugs may shut out commands or other ordinary sounds on which protection of the soldier's life may depend.

"There are many ways of shielding the head as well as the body from the shock pulse," Dr. Perlman said. "Any wall or partition will act as a shield. A mobile steel plate braced against the ground can shield a man from enormous explosions. Lying in a depression in the ground or even lying flat on the ground is effective because when a shock pulse originates from a bomb or shell striking or entering the ground the greatest energy of the pulse travels upwards and not along the surface of the ground."

"Putting a shield on a field piece or a turret around a naval gun protects the men from the shock pulse originating at the muzzle."

By way of giving greater realism to his report of the effects of explosions on the ear, Dr. Perlman told what would happen if a 200-pound bomb exploded in busy State Street outside the hotel where he was speaking.

"Eighty-five per cent of the middle ear injuries would be due to the shock pulse itself," he stated, "and only 15% would be due to bomb fragments. Excluding other injuries everyone on the street within a radius of 50 feet from the bomb would likely have ruptured ear drums with bleeding from the ear."

"Outside of this radius hemorrhage into the ear drum and myringitis (inflammation of the ear drum) may occur. Among those in the stores facing the street within this radius but shielded from the shock pulse by a wall, door or partition, only 0.5% would have ear injuries."

Science News Letter, October 24, 1942

No Help for Colds

► TYROTHRIN, potent germ-killing substance obtained from bacilli that live in the soil, has been tried with "discouraging" results in sinus disease and infections of the nose and throat of the kind most laymen refer to as colds.

Use of the substance in these conditions and its apparent failure in general to benefit the patients was reported

by Dr. J. R. Lindsay of Chicago at the meeting of the American Academy of Ophthalmology and Otolaryngology.

Tyrothricin is the crude substance isolated by Dr. Rene Dubos, at the Rockefeller Institute, and contains two crystalline substances, gramicidin and tyrocidine. Gramicidin has been hailed as an important new chemical remedy for diseases caused by germs of the gram negative group. Dr. Lindsay's experience with the parent substance, tyrothricin, shows one group of infections for which it is ineffective. Tyrothricin cannot be given by injection, because it must be kept out of the blood stream since it separates hemoglobin from the red blood cells. So Dr. Lindsay used it in the nose, throat and sinuses by spraying, swabbing and dropping.

Science News Letter, October 24, 1942

See Ear Drum Movements

► THE ACOUSTIC movements of the human ear drum have been seen and photographed for the first time. Moving pictures showing these movements of normal ears and also of ears of patients suffering from deafness were shown by Dr. H. G. Kobrak, of Gary, Ind., and Dr. J. R. Lindsay and Dr. H. B. Perlman, of Chicago, at the meeting of the Ameri-

can Academy of Ophthalmology and Otolaryngology in Chicago.

Fresh specimens from human cadavers were used. The various parts of the sound conduction apparatus were exposed and the vibrations during the con-

duction of sound were photographed.

"On stroboscopic illumination," the doctors pointed out, "one sees the acoustic vibrations of the ear as distinct and slow movements."

Science News Letter, October 24, 1942

MEDICINE

Try Immune Serum

In case an influenza epidemic comes this winter, the blood of persons who have just had the 'flu should "be considered" for protection.

► IF AN influenza epidemic strikes this winter, the use of immune serum from the blood of the first patients attacked "should be considered" for treatment and prevention and for further studies of influenza prevention, Dr. Joseph Stokes, Jr., of the University of Pennsylvania School of Medicine, declared at the meeting of the Medical Society of the District of Columbia.

Dr. Stokes' cautiously worded advice to his fellow physicians was based on extensive experiments with mice in which relatively small amounts of immune serum protected mice against influenza virus when the protective serum was inhaled by the mice. Somewhat larger amounts of the immune serum were required when the serum was injected. In treatment of the mice, the immune serum had to be given within six hours after infection with influenza virus.

Immune serum, from the blood of persons who have just had influenza, contains substances called antibodies which are defensive forces of the body for fighting off the 'flu virus. Instead of borrowing these defensive forces from someone who has already had the disease, it is possible to build them up in a per-

son's own blood by vaccination with influenza virus. Such a vaccine, Dr. Stokes recently reported, protected 43 out of 44 boys who were directly exposed to influenza virus in an experimental study.

Third method of protection against influenza epidemics described by Dr. Stokes consists in sterilizing the air of hospital wards, school rooms, barracks or similar places where large numbers of people congregate. This sterilization may be done by ultraviolet rays or by spraying propylene glycol vapor into the room. In the studies Dr. Stokes reported, the propylene glycol vapor seemed somewhat more effective than the ultraviolet rays.

Neither of these air sterilization methods, however, can be entirely relied on to stop an influenza pandemic such as swept the world in 1918. The reason, Dr. Stokes explained, is that in pandemics, the travel of the virus through the air may not be the chief manner in which the disease is spread. In pandemics, the disease breaks out suddenly in many widely separated places at the same time. Virus spread through the air is more a factor in epidemics such as those of recent years which travelled across this country in a few weeks.

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SUBMARINE VICTIM—This California Murre died while crawling away from the breakers. You can see blobs of thick grease on the bird as well as on the sand.

ORNITHOLOGY

Birds U-Boat Victims

► U-BOATS CLAIM thousands of victims never mentioned in the tragic lists of "missing at sea." They are aquatic birds—ducks, gulls and many others—that get their feathers soaked in oil set afloat from torpedoed ships (sometimes, too, from the fuel tanks of submarines destroyed in combat) and either sink from exhaustion or struggle ashore only to die in misery.

This distressing picture of suffering

among war's innocents is presented by Roger T. Peterson of the National Audubon Society (*Audubon Magazine*).

Normally, swimming birds' feathers, filmed with the birds' own natural body oil, keep their bodies warm and dry, no matter how cold the water they swim and dive in. But contact with mineral oil breaks this natural protection. Cold water reaches their skins, and if they do not die of chill and exhaustion, pneu-

monia is apt to set in. In any case, a badly oiled bird becomes unable to fly, and hence unable to seek its food.

Oil slicks on the water are deceptive death-traps. To birds, weary of flying, they are likely to look like patches of smooth water. Only when the luckless fowl has settled on one of them does it realize its mistake, and then it is too late. Sometimes, too, a duck will dive somewhere outside the boundary of an oil slick and come up in the midst of the oil. Then its doom is sealed in a most literal fashion.

Sea birds have only minor importance as food, but they have more than esthetic significance in other ways. Gulls and some of their relatives are natural garbage incinerators, and do much to keep down the amount of rubbish on our waterfronts. Eider ducks are prized for the light, warm down collected from their nests and used in making quilted jackets for aviators, seamen and others exposed to severe weather. Several thousands of these ducks have been oil-killed on Nova Scotia coasts alone.

Little can be done for oil-soaked birds, Mr. Peterson regretfully states. If they are really badly oiled, the most merciful thing is simply to make a quick end of their pain. Less severely oiled individual birds can be freed from the black contamination by careful treatment of their feathers with salad oil; but obviously that cannot be done for more than a few out of the many thousands of bedaubed sea-fowl. The most practical answer would seem to be to make as speedy an end as possible of the submarines, and when peace returns to obtain close observance of maritime rules against discharging oily bilge and ballast waters into the sea.

Science News Letter, October 24, 1942

ENGINEERING

Electronic Robot Records Changes During Flight

► A NEW electronic instrument is helping flight test America's newest airplanes by recording temperature and pressure changes at the rate of 144 readings every three or four minutes.

Developed by the Brown Instrument Company, this flight recorder replaces three or more men who needed half a minute to write down each reading.

First used on the world's largest plane, the Douglas B19, the recorder automatically prints on paper, during the test flight, the temperatures of all 72 cylinders of the four motors, changing

temperatures of the carburetor, exhaust, and of the oil in the fuel lines, and the pressures on wing struts, bulkheads and tail surfaces.

In the case of single-seater pursuit

ships, the recorder made records that otherwise could not be obtained because test engineers in addition to the pilot could not be carried aloft.

Science News Letter, October 24, 1942

MEDICINE

Cancer Fight Honored

► A MEDAL was pinned on a woman in New York City recently because of her long and valiant efforts in helping other women to escape cancer death. The woman is Dr. Elise S. L'Esperance. The medal is the Clement Cleveland Medal awarded each year by the American Society for the Control of Cancer and its New York City Cancer Committee.

Dr. L'Esperance's cancer-fighting has been carried on through cancer prevention clinics where thousands of women anxious to know if they had cancer were given thorough physical examinations in which every part of the body is searched for signs of the malignant disease.

"During the past five years," she reports, "approximately 1,500 women were examined and among these 7% were found to have cancer, most of them in the early stages. This 7% of cancer incidence represents the number of unrecognized early malignant tumors, 98% of which were curable because

recognized early and treated promptly. It also emphasizes the rather startling fact that five out every 100 of these adult women will now have an increased life expectancy of many years."

All of this work in prevention of cancer deaths was for and by women, you notice. But the masculine population, Dr. L'Esperance pointed out, is also subject to cancer. Each year 70,000 men die of cancer in the United States. As in the feminine population, many of these cancer deaths among the men could be prevented, and cancer preventive clinics need not be limited to women. With the war taxing hospital and clinic facilities and physicians' time and strength to the utmost, it may not be possible to get such clinics started immediately. The future possibilities for after the war are, however, worth keeping in mind. For the present, men should learn the minor symptoms that signal cancer in its early stages, and consult a physician promptly about them.

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FLIGHT RECORDER—Lieut. William C. Clay, Navy flight test officer inspects the ingenious electronic robot that obtains data in the flight testing of airplanes. The device was developed by the Brown Instrument Company.

PSYCHIATRY

Reject "Bad Risks"

Army growing more strict about mental health requirements for inductees. Over seven per cent now rejected on this basis. Shortage of psychiatrists hampers work.

► THE ARMY is tightening up on mental health requirements for the induction examination.

Modern warfare is tough. And the men who go into it must be in top-notch mental as well as physical health. The Army does not want to be burdened with men who can get by under normal civilian living conditions, but who would go to pieces mentally if they had to face enemy fire or the strains of prolonged hardship in battle areas.

Seven or eight men out of every 100 who come up for induction examination are now rejected because they are what insurance men would call "poor risks" from a mental health standpoint. This is according to the latest figures available which date back to July of this year.

That was before the 1B men were reclassified and those fit for limited service put into 1A. Just what effect the calling of men with physical defects and older age groups will have on the rejection rates for mental reasons cannot be predicted. It may be that more of these men will be found unsuited to Army life. It may be that fewer will have to be turned down.

The rejection rate for mental and nervous causes varied between 6.8% and 8.4% during the months from April, 1942, to July.

This information was furnished to Science Service by Col. R. D. Halloran, head of the new Psychiatric Division of the Army Surgeon General's Office, in response to an inquiry about Mrs. Eleanor Roosevelt's fear, expressed in her newspaper column after a recent visit to a San Francisco Army hospital, that "We are not giving our draftees a sufficiently careful psychiatric examination before they are taken into service."

Col. Halloran quoted the figures that indicate a trend toward a more critical examination. When draftees were put through a double screening of local Selective Service examination plus an Army induction examination only about 5% were rejected.

For the beginning of 1942, when the Army first took over complete responsibility for the examination, comparable

figures are not available. It seems likely, however, that standards may not have been so strict—certainly they varied from place to place and the whole examination procedure was experimental. Men who should have been rejected, but who slipped through the examination net at that time might be showing up as hospital cases now.

"I believe that now we are doing a very good selection job with what facilities we have available," Col. Halloran said.

The Army is seriously handicapped by a severe manpower shortage of psychiatrists. There are only about 3,000 psychiatrists in the whole United States, Col. Halloran said. Of these, nearly a third are in the Army, among them a large proportion of younger men. It is necessary to leave some to man all the mental hospitals for civilians, although these have been cut to the bone.

In all communities where there are properly trained and experienced civilian psychiatrists available, their services are asked and are generously given on induction boards, he said. There are many communities throughout the nation where there just aren't any psychiatrists.

To these localities, the Army sends their own psychiatrists. Each Induction Board has at least one psychiatrist, and each draftee or recruit must pass examination by a psychiatrist—a brief one, to be sure—before he can enter the Army.

The Army is also handicapped by the speed which men must be examined and the numbers passing before the Induction Board at one time. Psychiatrists are used, in civilian life, to devoting many hours to a psychiatric examination. It is not like a lung examination or syphilis test where X-rays or laboratory data tell the whole story. The psychiatrist must consider the whole man and the way he reacts as a complete personality to strain, responsibility and hard work.

"When you have examined 70 men in a day," Col. Halloran explained, "it is possible that you might miss subtle signs in the 71st man that you would have picked up in the first man. Physicians get tired, too."

The Army is now working out methods of improving the examination and securing facts about the man's past history not now available. In some localities, a cooperative scheme is being worked out by which the State Mental Hospitals are furnishing to Induction Boards records of hospital treatment on men coming up for Army examination, and social workers for the Red Cross are checking up on what is known locally about the man's ability to keep out of trouble at home. If successful, these methods will be applied on a nation-wide scale.

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FORESTRY

African Mahogany Trees Grow Well in Florida

► MAHOGANY for future fleets of speed boats, as well as for home and hotel furniture, may come from cultivated forests of African trees grown in Florida. Experimental plantings of Rhodesian mahogany trees on the grounds of the subtropical experiment station of the University of Florida, are catching up in height with native fast-growing pines twice their age, have trunks twice the diameter of pines as old as themselves, and appear to be forming wood four or five times as fast. (See photograph on page 259.)

On the strength of this performance, S. J. Lynch and H. S. Wolfe of the experiment station staff express the opinion that they "appear to be the most promising hardwoods for reforestation in South Florida that have been tested by the Sub-Tropical Experiment Station."

The trees belong to one of two African genera of mahoganies, and are known botanically as *Khaya nyasica*. To distinguish them from other African mahogany species, it is proposed to call this species East African or Rhodesian mahogany. The African mahoganies generally are closely related to the American genus, *Swietenia*.

The oldest trees in the plantings, although set out in rather unpromising-looking sites only 12 years ago, already have seven- to eight-inch trunks and average around 40 feet in height. Although distinctly tropical in origin, they have survived several cold spells, including one freeze when the temperature dropped to 27 degrees Fahrenheit. So far, the trees have not been attacked by insect pests or diseases.

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MEDICINE

Use of Auxiliary Drug With Morphine Fails

► **HOPE FOR** doubling the nation's stockpile of morphine through use of a potentiating drug is discouraged by research reported by Dr. Howard L. Andrews, U. S. Public Health Service (*Journal, American Medical Association*, Oct. 17).

By giving prostigmine methylsulfate with morphine, it had previously been reported by other scientists, pain could be relieved with only about half the amount of morphine usually required when given alone. Besides conserving morphine, this potentiating drug might also reduce the risk of morphine addiction developing from morphine given to relieve pain.

As a result of studies at the U. S. Public Health Service Hospital at Lexington, Ky., where narcotic drug addicts are treated, Dr. Andrews concludes:

"It appears that the combination morphine-prostigmine methylsulfate is not significantly more effective in raising the pain threshold than morphine alone and that the addition of prostigmine methylsulfate does not appreciably change the rate at which tolerance is developed."

Science News Letter, October 24, 1942

ASTRONOMY

Variable Star Observers Make 33,090 Observations

► **A TOTAL** of 33,090 looks at variable stars, those flashing beacons of the night skies, have been turned in by members of the American Association of Variable Star Observers during the past 12 months, bringing the 31-year total of the amateur observers up to 880,000. This is reported by Leon Campbell, of Harvard Observatory, recorder of the A.A.V.S.O.

Ninety observers compiled the year's total, Mr. Campbell said. One of these, Cyrus Fernald, of Wilton, Maine, maintained his position of leader, gained last year, with a total of 4,206 observations. He worked 207 hours in observing time alone, averaging 20 stars an hour, which is very fast for this kind of work. Several other members, including Leslie C. Peltier, of Delphos, Ohio, famous as discoverer of seven comets, turned in from 2,000 to 2,500 observations each.

In a long-range program of analyzing the amateur observers' reports, Mr. Campbell has just concluded the deter-

mination of 12,000 maxima and minima times for some 250 stars out of his observing list of 700. This and other information is of great value to professional astronomers in their studies of variable stars.

The Merit Award of the A.A.V.S.O. granted only five times previously, was bestowed on D. F. Brocchi, of Seattle, Washington, who has long served as chairman of the chart committee of the Association. Previous recipients of the Merit Award have been: L. C. Peltier, William Tyler Olcott, Rev. T. C. H. Bouton, E. H. Jones, and David B. Pickering.

Science News Letter, October 24, 1942

MEDICINE

12-Cylinder Medical Care Asked for Bicycle Income

► **DOCTORS** must find a way to "bring a 12-cylinder standard of medical services to a man who can barely afford a bicycle," Dr. George W. Cottis, president of the Medical Society of the State of New York, declared at the meeting of the First District Branch of the Society.

He challenged the doctors to find answers to this and a dozen other pressing questions, among them the following:

How shall we extend preventive measures to the whole population and so lessen the need for curative medicine?

How provide proper care to our civilian population when the most virile one half of us are in the armed forces?

How care for defense workers and workers in general industry? How meet the demands of thousands of workers and their families today in an area where yesterday was only a scattered rural population?

How clear our own house of legalized quacks and fakers?

How force the speeding up of the production of doctors by casting out deadwood from curricula and rearranging courses?

"As a nation we are beginning to appreciate the tremendous cost of the wishful thinking, wilful blindness and inexcusable ignorance of world affairs which resulted in our unpreparedness to meet what was plainly inevitable," he declared. "As a profession we should profit by that experience and make sure that we know what is happening or is about to happen to us."

Science News Letter, October 24, 1942

IN SCIENCE

INVENTION

Develop Non-corrosive Oil For High Pressure Bearing

► **HOW TO** produce non-corrosive lubricating oils for use where pressures between the bearing surfaces rise to more than five tons to the square inch, is told by Carl F. Prutton of East Cleveland, Ohio, in U. S. patent 2,298,636. The rights have been assigned to the Lubri-Zol Corporation of Cleveland.

High pressure lubricants are usually corrosive, the inventor states, in fact depend on chemical action between the oil and metal to prevent seizure and scoring of the bearing surfaces. But he has found that certain halogen carbon compounds, particularly chlorinated compounds, inhibit this corrosive action without destroying the high pressure qualities of the lubricant. The action seems to be to form a protective film on the metal which prevents electrolytic action to which the corrosion is due.

His new "inhibitors" can be used to make new high pressure oils or to improve existing ones.

Science News Letter, October 24, 1942

ARCHAEOLOGY

Ancient Europe Said To Be Land of Milk and Honey

► **PREHISTORIC** Europe, as well as Palestine, was a land "flowing with milk and honey," according to Professor Grahame Clark, British archaeologist, writing in the journal, *Antiquity*.

Cheese, honey and beeswax were among the chief barter products used by prehistoric Europeans living in the Alps. And among the products of Brundisium, a town in ancient Italy, "honey and wool were strongly commended," according to the Greek geographer Strabo, quoted by Professor Clark.

Honey, beloved of the Egyptians, was the only source of sugar known to most of the ancients. Europeans too, of the Early Bronze Age, used it. Chemical analysis of sediment in an ancient Danish coffin showed that honey and myrtle had been added to cranberry wine.

Science News Letter, October 24, 1942

NEW FIELDS

ENGINEERING

Cut-Out for Rural Electric Lines Perfected

► FOR PROTECTION of rural electrification lines, a simple cut-out has been perfected which distinguishes between a temporary surge, such as caused by lightning, and a graver fault requiring lengthy repairs. Five seconds after a fault has caused the breaker to open, it recloses. If the fault is still present, the breaker reopens and again recloses after five seconds. Then the breaker reopens, if the fault still remains, and stays open until repairs are made. This device, developed by the Westinghouse Electric & Manufacturing Company, saves needless repair trips in rural areas remote from the service and expensive equipment available in the cities.

Science News Letter, October 24, 1942

INVENTION

New Plane Control Cables Have Uniform Tautness

► TO COMPENSATE the control cables of an airplane for changes in temperature, tilt or other conditions that might cause them to become too loose or too tight is the object of the invention of Henry H. Bruderlin of Hermosa Beach, Calif., who has received U. S. patent 2,298,611 and assigned the rights to the Douglas Aircraft Company.

The general practice has been, the inventor states, to string these cables so tight in the first place that under no ordinary conditions will they become too loose to operate. This increases friction, requires undue effort by the pilot to operate them, and shortens their life. The object of his invention is to maintain a constant tension on the cables and to increase the range of variations that can be taken care of.

The constant tension, he says, gives the control stick always the same feel to the pilot, and better enables him to detect and estimate flutter of the control surfaces.

The compensation is brought about by a spring housed within the control surface. The cable is divided at this

point and the two ends attached to the spring. If the cable is pulled in either direction, the spring is locked out, so that the connection to the control surface is then direct and positive, the same as for a cable permanently attached.

The inventor claims that this device will compensate even for a considerable distortion of the plane itself, such as can occur in combat, which would alter the run of the cables and put uncompensated cables out of commission.

Science News Letter, October 24, 1942

CHEMISTRY

Fluorescence May Help Testing of Gas Masks

► SOME OF the difficulties encountered in gas mask testing are well known to many people. These devices must be rendered gas and vapor tight, and the most rapid and effective way of detecting leaks often presents a problem, especially when mass production is involved.

With fluorescent chemicals, those substances which glow under ultraviolet light, it may become possible to test gas masks quickly and with certainty, thus eliminating one of the bottlenecks in our war effort. The originator of the method is Jack De Ment, Portland, Oregon, chemist, who has conducted many studies of fluorescent substances and ultraviolet light.

Briefly, in testing the efficacy of a new mask, very finely powdered anthracene or other fluorescent chemical is allowed to filter into the test chamber under mild pressure. It is possible to immediately detect leaks in the mask and determine exactly where they occur, whether in the fabric, in the mechanism, or about the edges, by examining both mask and subject under ultraviolet light, a bright green glow showing entrance of luminescent powder into the mask. Or, liquids and vapors can be used instead of powder, depending on the type of gas, smoke, or fog, the mask is intended for. The new technique presents interesting possibilities when it is realized that unweighable amounts of chemical can readily be seen on the skin of the wearer's face or inside the mask with "black light". Many fluorescent chemicals are known which can be detected in dilutions as great as one part in several hundred million.

Further, the gas-tightness of boxes, food and medicine containers, suits, and other objects, can be tested by the improvisation.

Science News Letter, October 24, 1942

NUTRITION

Soldiers in Tropics Need Changes in Their Diet

► FINDING the right diet to keep a soldier fit whether he is in training at a home camp or fighting in the desert or in the tropics is the job scientists are now tackling, Prof. Charles G. King, of Columbia University, told members of the American Chemical Society at a meeting of the New York Section.

"The extremely heavy perspiration caused by tropical climates, and the scorching days and freezing nights of desert fighting zones, apparently require a diet differing from that ideally suited to the conditions in a typical American camp," Prof. King explained.

"While still striving to find what a man needs to eat under normal conditions, nutrition leaders were suddenly faced with the problem of feeding men under extremes of temperature, of enclosure and sunlight, of ocean depths and high altitudes, and of great exhaustion.

"Loss of flavor and of nutritional value in food as a result of storage and shipping to tropic or arctic zones, and the loss of stability in fats are other problems which must be solved immediately."

The Nutrition Foundation, of which Prof. King is scientific director, is making research grants to universities, and is working in cooperation with other agencies such as the Office of the Surgeon General and the Food and Nutrition Board of the National Research Council in carrying out a program adapted to the needs of both the civilian population and the military services.

Science News Letter, October 24, 1942

INVENTION

Synthetic Fabric Replaces Horsehair in Linings

► A SYNTHETIC stiffening fabric to replace horsehair in the interlinings of coats, dresses and upholstery, is the invention of Albert Faris Smith of Wilmington, Del. (U. S. Patent 2,298,071) and assigned to E. I. du Pont de Nemours & Company.

The great advantage of the new fabric is that the stiffening fibers can be made in different sizes or may be tapered from end to end so that the stiffness of the fabric can be varied from one part to another as desired. Thus a turn-down collar may be made flexible at the crease, but more stiff toward either edge.

Science News Letter, October 24, 1942

PHYSICS

Rocket Planes Next?

Planes without propellers or engines are still only dreams for the future, but immediate and practical uses do exist for high-power rockets in war.

By DR. MORTON MOTT-SMITH

► AIRPLANES without engines or propellers, driven solely by rockets, may streak the skies at incredible speeds and altitudes, if investigations now in progress throughout the world realize the dreams of those who are making them.

No one knows what the exact state of this work is in the various warring countries. But whichever nation zooms into the air with a practical ship of this type will have a big advantage over the others—perhaps a decisive advantage.

When will this happen? Perhaps tomorrow, perhaps not for a long time, perhaps never—for there are still vast difficulties to overcome.

Ever since the public learned that rocket propulsion would function in a vacuum, better in fact than in air, space ships traveling from planet to planet have been envisioned as part of the future world.

But at present there is no known fuel powerful enough to lift its own weight beyond the earth's attraction, let alone carry a ship with it. The proposal has been made to build a ship in sections that would be successively dropped off. This is a possible solution, but calculations show that the weight which must be dropped off plus that which is shot out in the rocket jet would equal the weight of a small mountain.

Space Travel Awaits Atomic Power

Space travel must evidently await the advent of something approaching atomic power.

But applied to an airplane, the rocket has tremendous possibilities. Here are some of them as calculated by a German scientist about the time the Nazis came into power.

The calculations are based on measurements of thrust and velocities of jets produced by various fuels and variously shaped nozzles. The scientist is Eugen Saenger who published his findings in the German magazine *Flug*, an English translation of which has recently been issued by the National Advisory Committee for Aeronautics in Washington as Technical Memorandum No. 1012.

Herr Saenger envisions a small fighter plane, specially streamlined for speeds greater than that of sound, burning gasoline and carrying liquid oxygen to support combustion, and with very small wings in proportion to its weight. Most of the interior is occupied by fuel and oxygen tanks. The rocket motor is merely a spherical combustion chamber and a nozzle in the rear of the plane. Its size and weight are insignificant compared with other engines. Yet it develops 100,000 horsepower for a short time, giving 500 horsepower for each pound of its weight, as compared with 2,000 horsepower of our large bomber engines, giving one horsepower for each pound of weight.

Here's what this fighter plane would do.

Climbs Fast

On the approach of enemy planes it would rise from the ground at an angle of 30 to 45 degrees to a maximum height of about 12 miles. This it would attain in four minutes. The best planes of his day, Herr Saenger states, require five minutes to climb to a height of three miles, and six miles is their utmost limit.

The fighter then swoops down on its victim unseen and unheard at a similarly

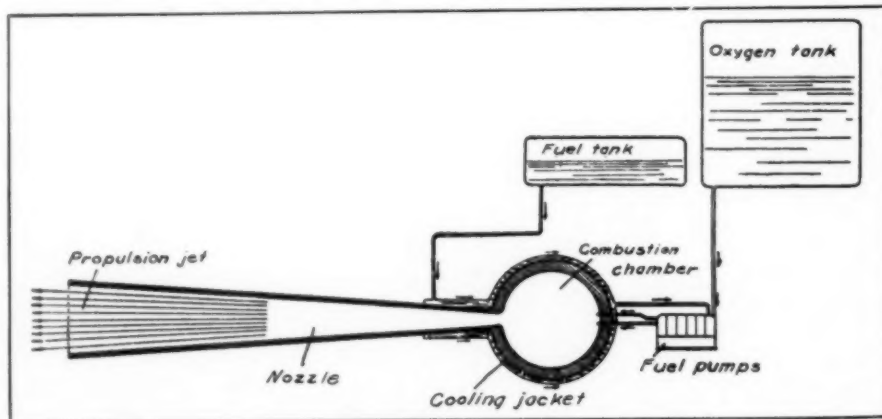
steep angle and blasts him from the sky before the poor fellow knows what has happened. The plane cannot be seen because it is traveling at near projectile speed. It cannot be heard in advance because it is moving as fast as its noise. It might accidentally be picked up at a distance of one kilometer (0.6 mile), Herr Saenger admits. But it would cover this distance in three seconds! There would be no time to train a gun on it as it approached. And it could not be hit as it receded because no projectile could overtake it.

Fuel Lasts Half Hour

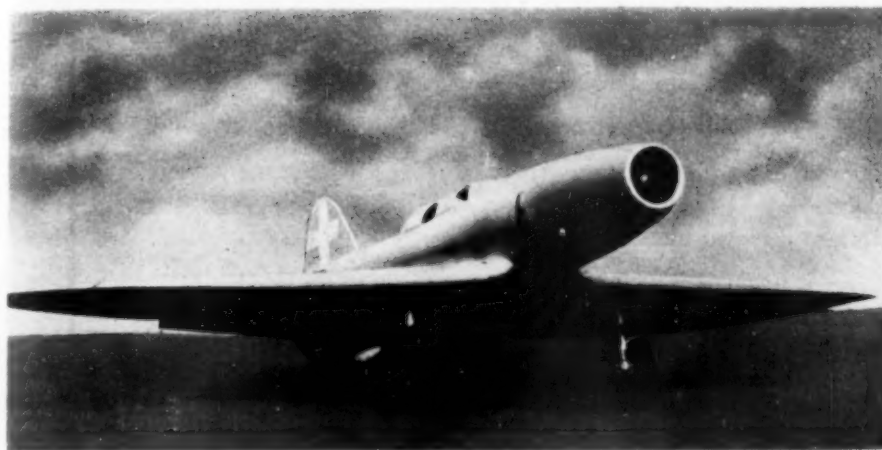
The entire fuel of this plane is consumed in one-half hour at full power. During that time, however, it can cover upwards of 500 miles, partly under power, partly gliding. It must then descend to refuel.

Despite the abbreviated wings, adapted for high speeds, there is no difficulty in landing, because the plane in its flight has thrown away 80% of its weight in burnt fuel. With empty tanks, the wing surface in proportion to weight is five times as great as at the takeoff, so the plane may land at as slow a speed as any other.

Herr Saenger envisions a bomber plane whose performance is even more remarkable. Its flight, he says, is a cross between that of a plane and a projectile. It rises from the ground under full power at an angle of 30 degrees. The ascent is continued until the fuel is exhausted.



THE ROCKET MOTOR diagrammed, uses fuel which has first passed through the cooling jacket surrounding the combustion chamber. Liquid oxygen, together with the fuel, is shot into the combustion chamber by fuel pumps which are the only moving parts.



JET PROPELLED PLANE, the first to appear practical in test flights, winged the 168 miles from Milan to Rome using a combination engine and rocket as the power source.

This occurs in 15 to 20 minutes. But the bomber is then 25 or 30 miles above the earth and traveling with a speed of 5,000 miles an hour or more. With this speed, the plane is simply a super-projectile shot from that point of the sky. It continues to rise to an ultimate height of 37 miles. Then it begins slowly to descend. But being a winged projectile the glide path is 3,000 miles or more.

At the proper moment the bombs are released and the plane describing a wide arc returns to its base.

For a shorter distance the plane would ascend to a lesser height, which would be calculated in advance.

Herr Saenger points out that a flight could be made in any kind of weather, since the weather is miles below, and that no hostile agency could wreak the slightest harm on his superplanes. With weapons like these, he opined, the rest of the world would know only of "conquered peoples."

Still Theory

But Herr Saenger's dreams have not yet come true, although how far they may be on the way we have no means of knowing. The only successful flight of a true rocket plane on public record is that of Fritz von Opel in 1929, and that was of short duration only 50 feet above the ground and the plane was damaged in landing. This flight was made with rockets of the gunpowder type.

Experiments in sending aloft unmanned rockets carrying liquid oxygen have in general failed due to the high pressure developed in the oxygen tank and the difficulty of keeping the intense heat

of the combustion chamber away from the intense cold of the liquid oxygen.

The great weight of the oxygen which is several times that of the fuel, is also a serious obstacle. For every pound of hydrogen in the fuel, eight pounds of oxygen must be carried, and for every pound of carbon, nearly three pounds of oxygen.

Jet Propelled

Because of these difficulties, much attention has been devoted of late to a type of jet propelled plane which takes its oxygen from the air. Such a plane cannot, of course, ascend to heights where the air is too thin to supply the required amount of oxygen, nor can it in the denser air attain the tremendous speeds possible to the ship that carries its own oxygen.

This is a hybrid type of plane, a combination of engine and rocket, although propelled entirely by the jet thrown out in the rear. Air is taken into the fuselage at the nose and accelerated toward the rear by a blower or compressor driven by an engine. Fuel is burned in the air stream, which includes the engine exhaust, just before it enters the nozzle.

While the weight of the oxygen is thus saved, that of the engine and compressor are added. In fact, except for the addition of the rocket motor in the rear, this plane differs from the ordinary one only in that the engine and propeller, instead of being on the outside of the plane and directing an air blast to the rear, are on the inside. If large enough, this apparatus alone could drive the plane, although not as efficiently as when located on the out-

side. The rocket motor then becomes merely an auxiliary source of power. If the compressor is small, it merely acts as a supercharger to supply the rocket motor with oxygen. Various gradations of rocket power may thus be achieved.

This plane may therefore form a stepping stone to complete rocket propulsion by allowing the experimenter to approach the latter by successive and comparatively safe steps.

Italian Success

Two successful planes of this type have been designed by Signor Campini and built by the Caproni Airplane Company of Milan, Italy. The second plane was flown last December from Rome to Milan, a distance of 168 miles, at an average speed of 130 miles per hour. This is the first time a jet propelled plane has flown any considerable distance. No attempts were made at high speeds, high altitudes or at other stunts. The performance is believed to be inferior to that of comparable planes of the usual sort. But Signor Campini has stated that he expects his type of plane to show superiority only at speeds above 400 kilometers (248 miles) per hour.

The rocket motor is in fact the world's most inefficient motor at low speeds. At take-off the efficiency may be as low as 2%. For the highest efficiency, the speed of the plane must be equal to the speed of the jet. This can occur only when there is absolutely no resistance to the motion of the plane, that is, in a perfect vacuum. Herr Saenger believes that this condition would be approached by his theoretical rocket planes at the altitudes they could reach. But practically all of the fuel they could carry would be consumed in getting there.

But despite its inefficiency at low speeds, the enormous power that a rocket can develop for a short time without any heavy engine to develop it, has immediate and important military uses.

29

Languages

by Linguaphone

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It has long been proposed to use rockets as boosters to assist in getting a heavy bomber or transport plane off the ground, and this method is now in general use in England and in Germany. Once in the air, flight can be maintained with much less power than is required at take-off, so that with rocket assistance heavier loads can be carried.

German planes shot down during the Battle of Britain disclosed the fittings of rockets under their wings. The Heinkel 111K used two rockets said to provide 3,000 horsepower for three minutes, long enough to assist at take-off and up to

3,000 feet. The rocket tubes were then dropped off. This plane is powered with 1,300 horsepower engines, so that the rocket assistance was equivalent to more than two extra engines.

Rockets have been proposed for carrying messages to the rear, for increasing the range of anti-aircraft guns, for shooting bombs downward, and for many other purposes, so that while the rocket propelled airplane may still be a thing of the future, there are many immediate and practical uses for high-power rockets.

Science News Letter, October 24, 1942

PUBLIC HEALTH

New Health Record

U. S. Army has less venereal disease than during World War; syphilis rate is lowest in Army history. Thorough control program credited.

► NOT EVEN the venereal diseases, those hitherto invariable scourges of an army mobilized for war, have been able to spoil the excellent health record of our present Army.

"Venereal disease is substantially less than during the World War, with the syphilis rate now the lowest in Army history," the War Department announces in its latest statement on the health of the United States Army in training in this country.

This statement may be looked on as official announcement of a hard-won victory, another of the triumphs which the medical department of the Army has rung up as a result of efficient use of modern scientific methods for fighting disease. Here is how this medical victory was won.

When we started increasing the Army in 1940 through the Selective Service Act, we were all proud of the fact that it was the first Army in history recruited entirely from men free of any venereal disease, at least at the time of selection.

Then came a period of disillusionment. Venereal disease rates, which had been declining in the Army for many years, began to rise. Men free of syphilis or gonorrhea when examined by Selective Service boards arrived at Army induction camps with freshly acquired infection. Venereal diseases and prostitution had gotten out of control by public health and police authorities in many towns near the rapidly growing Army camps. Civilian authorities declared they

could not handle the problem alone, urged the Army to invoke the May Act, passed by Congress to enable the Army to protect the men from venereal disease that might be acquired in communities near Army camps.

The Army, meanwhile, called in from civil life every specialist in venereal disease control it could get. It assigned venereal disease control officers to the headquarters of each corps area, to each major division in the field, to the air forces and to each large Army camp. These officers got full cooperation from the civilian agencies for the control of venereal disease in communities near Army camps. Under their direction, each soldier is taught how to protect himself from venereal disease and facilities for prophylaxis are provided.

The venereal disease rates as a result have shown a steady decline. The victory score board shows that in 1941 the total venereal disease rate, on a yearly basis, was 40.5 per 1,000 men. For the first six months of 1942 the rate, on a yearly basis, was 38 per 1,000, including cases arising in newly inducted soldiers where the infection actually was acquired in civil life.

"This means," states the War Department, "that about 19 new infections occurred among every 1,000 men during the first half of this year. Soldiers thus infected lose an average of 18 days or less from duty."

Most of the venereal disease rate now is due to gonorrhea which is much less

serious than formerly because of the speed and effectiveness of the sulfa drug treatment for it.

So, although war or civil disturbance has always in the past brought an increase in venereal disease rates in armies, we are sending to war an Army in which the venereal diseases are taking less and less of a toll.

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INVENTION

New Polarizing Glasses Used for Different Colors

► POLARIZING eye glasses which will transmit or cut off light of two different colors or regulate intensity and color at will by simply rotating the lenses, are described in U. S. Patent 2,298,058 issued to Edwin H. Land of Cambridge, Mass., and assigned to the Polaroid Corporation of Dover, Del.

The new rotatable lenses are superposed on the regular polarizing glasses, much used to cut off the glare of light reflected up from horizontal surfaces. The new lenses contain two polarizing films, with their polarizing axes crossed at right angles. Each is impregnated with a dye and polarizes only a particular color, instead of all colors or white light as is the case with the regular glasses.

Suppose the two colors are yellow and blue. When turned say to the extreme left, yellow light is transmitted, to the extreme right, blue is transmitted. Midway between, the light is neutral or without color. At other positions any desired degree of coloration for either color can be obtained.

Or suppose that one film is green and the other neutral. When the neutral film is crossed with the regular glass, which is also neutral, say at the extreme left, scarcely any light at all passes. As the lens is turned, the light becomes brighter and greener until at the extreme right it is fully green.

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Books

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BIOLOGY

NATURE RAMBLINGS

by Frank Thone



"Now I Lay Me"

► SOME ANIMALS escape death in winter by feigning death. For that is what the deeper forms of hibernation amount to, at least so far as appearance is concerned. If you dig up a hibernating ground squirrel, for example, you can shake it, pinch it, drop it on the table, even stick pins in it—and it remains as limp and inert as if its neck were broken. Only a fairly long exposure to warmth will bring it to. Hibernating cold-blooded animals, like toads and bumblebees, seem even "deader".

The physiological processes of animals in deep hibernation seem only a step or two removed from death. Breathing is imperceptible by ordinary means, the pulse slowed down so that you'd think the next heartbeat would be the last. Body temperature of warm-blooded animals drops away below normal — they become almost cold-blooded animals for the time being.

There is a high survival value in this severe banking of the biological fires. A hibernating animal, whether a bumblebee or a bear, gets nothing to eat, nothing to drink, through the long weeks of winter sleep. The flame of life has to be kept going until spring on food stored in the animal's own tissues, usually in the form of fat. Bears are notoriously roly-poly in autumn, lean as bare bedsteads when they emerge from their dens. If life can be reduced to just a few faintly glowing embers, it makes for greater economy in the use of body fuel and hence for better chances to get through until spring.

Hibernation is resorted to by a surprising array of creatures. Big mammals like bears, little ones like groundhogs

and gophers, reptiles like snakes and turtles, amphibia like frogs and salamanders, insects, spiders, crayfish, even worms. Birds don't; they can migrate, so they don't need to. Fish don't; though in the tropics some of them go into a similar state in the dry season. Because that happens in summer it is called aestivation.

There is a great range of degrees in hibernation. Some animals, like the ground squirrels already mentioned, go

the limit and don't wake up until spring. Bears, on the other hand, are apt to wake up during warm spells and come out for a stretch and a sniff of fresh air. The same is true of their insect namesakes, the black-and-orange caterpillars called woolly bears. Some animals, like beavers, sleep a great deal more in winter than they do in summer, but awaken and feed from time to time. That, however, should probably not be classed as hibernation at all.

Science News Letter, October 24, 1942



THE ARMY-NAVY "E" Flag awarded to Bausch & Lomb recently for continuous achievement in production for Victory is the third in a series of "E" awards. Previous awards included the original Navy "E" and the All-Navy "E" Burgee with star.

"Eyes Right" Has Never Meant So Much To America

EVERY job in Production for Victory calls for top visual efficiency. This means that eyes must function unflinchingly and unflinchingly—at lathe, bench and on assembly line, in research and control laboratory, over drafting board and foundry flask.

Upon the skill and training of the nation's thousands of eyesight specialists rests the responsibility of forestalling eye-strain as an unconscious saboteur.

As a maker of ophthalmic products—the instruments used in the scientific examination of the human eye, the spectacle lenses and frames which these specialists use—Bausch & Lomb has an important

part in America's war effort.

In the development and manufacture of actual fighting equipment, such as rangefinders, aerial height finders, binoculars, aerial map-making equipment, Bausch & Lomb is serving the Armed Forces directly. At the same time, Bausch & Lomb is providing the metallographic equipment, the microscopes, spectrographs, contour measuring projectors, optical glass and special instruments required by other manufacturers in filling military needs.

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ENGINEERING

Dye Shows Metal Flaws

Fluorescence detects defects in war metals. New method is more sensitive than old procedure. New alloying methods also reported at meeting of Society for Metals.

► HOW MINUTE cracks, porosity and surface blow holes in metals, invisible to the eye and to X-rays, can be beautifully shown up by use of a fluorescent dye and ultraviolet light, was shown to the American Society for Metals meeting in Cleveland, by Taber de Forest, research engineer of the Manalux Corporation of Chicago.

The method is far more sensitive, Mr. de Forest said, than the old kerosene and whitewash method that has been used for this purpose. The liquid which carries the dye penetrates the minutest cracks by capillary attraction, and is washed off from the rest of the surface by plain water.

It is true that either of these methods reveals only cracks that reach the surface, but deep-seated defects, Mr. de Forest said, are often connected with the surface by a network of capillary cracks. Fatigue cracks, it is known, originate on the surface, and shrinkage cracks of castings often appear there. Besides, a small crack is often the starting point of a later failure.

These small cracks are not revealed by X-rays because only a relatively spacious void will show up.

Science News Letter, October 24, 1942

Diffusion of Metals

► A SIMPLER and faster method for observing the rate at which one solid metal diffuses into another, an important matter in many practical fields, was described at the American Society for Metals meeting by Howard S. Coleman

and Henry L. Yeagley, physicists of the Pennsylvania State College, State College, Pa.

An extremely thin film of the one metal was condensed on the surface of a microscope slide, and a similar film of the other metal deposited on top of it. Such extremely thin films are semi-transparent. The reflecting power of the contact surface between the two metals was measured and recorded continuously by a photoelectric method, using a powerful automobile headlight as a source of light. As the one metal diffused into the other, the reflecting power of the surface diminished, and was shown by a drooping curve. In some cases the experimenters declared, a test could be made in five minutes.

Science News Letter, October 24, 1942

New Alloys Made

► A NEW method of making alloys of metals that do not mix when melted, and therefore cannot be alloyed in this manner, was described in a paper by M. L. Samuels, A. R. Elsea and K. Grube, research metallurgists of the Battelle Memorial Institute of Columbus, Ohio, presented at the meeting of the American Society for Metals.

For example, aluminum and lead when melted do not dissolve in each other. However well the mixture is stirred, when it solidifies nearly all the lead is found at the bottom, nearly all the aluminum on top, since lead is more than four times as heavy as aluminum.

But aluminum and tin do mix well when melted. On cooling, the aluminum, having the higher melting point, solidifies first in tree-like forms that interlace throughout the mixture. The spaces between are filled with the still molten tin. On further cooling, the tin solidifies and an alloy is produced in which the two metals are well and uniformly mixed throughout the mass.

The experimenters have found that this aluminum-tin alloy can be converted into an equally good aluminum-lead alloy by displacing the tin with

● RADIO

Saturday, October 31, 1:30 p.m., EWT

"Adventures in Science," with Watson Davis, director of Science Service, over Columbia Broadcasting System.

Dr. Eugene P. Pendergrass, of the University of Pennsylvania, will describe new research on X-ray.

Tuesday, October 27, 7:30 p.m., EWT

Science Clubs of America programs over WRUL, Boston, on 6.04, 9.70 and 11.73 megacycles.

One in a series of regular periods, over this short wave station to serve science clubs, particularly in the high schools, throughout the Americas. Have your science group listen in at this time.

Monday, October 26, 9:15 a.m., EWT

Repeated at 1:30 p.m., PWT

Science at Work, School of the Air of the Americas over the Columbia Broadcasting System, presented in cooperation with the National Education Association, Science Service and Science Clubs of America.

"Liquid Power" will be the subject of the program.

lead. To do this, the alloy is heated in a pot to a temperature which melts the tin but not the aluminum. Molten lead is then poured on top, and seeps into the metal, pushing the tin before it. The latter runs out through a hole in the bottom of the pot. In this way, an aluminum-lead alloy is produced having the same intermixture of metals that the aluminum-tin alloy had.

The method is applicable not only to metals that do not mix at all, but also to those that do not mix well enough to produce a good alloy, thus opening the way to improving these alloys. Thus copper and tin, when the tin content is high, do not mix well. By first making an alloy of copper and bismuth, and later replacing the bismuth with tin, the experimenters succeeded in producing a superior and hard alloy. In fact, they produced a number of impossible alloys, and improved several difficult ones.

Science News Letter, October 24, 1942

AERONAUTICS

View on Cover Shows Test In Engine Research Lab

See Front Cover

► AN INSIDE view of the engine propeller test chamber of the new Aircraft Engine Research Laboratory of the National Advisory Committee for Aeronautics is given in the picture on the front cover of this week's SCIENCE NEWS LETTER. The mighty wind stirred up by the propeller gives information about what its performance will be in an actual airplane. Many other tests are made at this great plant to insure that our air-men get engines as nearly perfect as possible.

Science News Letter, October 24, 1942

THE SCIENTIST IN ACTION

by
W. H. GEORGE

A SCIENTIFIC STUDY OF HIS METHODS

This book is for those who need to do ORIGINAL thinking. CLEAR thinking. THINKING WITH A PURPOSE. Helps you to DISCOVER ideas, tells you how to DEVELOP them! Explains clearly METHODS OF WORKING to get RESULTS.


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❁ **GLEAMING BICYCLE** pedals that reflect back light from the headlights of an approaching automobile whether the auto approaches from the front, rear or the side, is the safety measure provided by a recent patent. The reflectors are easily attached to the pedals and do not interfere with their operation.

Science News Letter, October 24, 1942

❁ **MORE MILES** per tire is the object of a new cotton protector that goes in between the inner tube and the tire casing, protecting the inner tube from rough and broken cords on the inside of the casing. Thus both can be used longer.

Science News Letter, October 24, 1942

❁ **IMPROVED ANTIGLARE** and safety goggles, composed of metal instead of glass or other transparent material, are now available. Each eye-covering has two slits, one horizontal, the other vertical, permitting vision in these two directions. In the new goggles, there is an additional slit lower down and slightly inclined to permit downward vision. The metal is strong enough to protect against flying fragments, and steam or perspiration do not interfere with vision. A crude form of this arrangement is said to have been invented by the Eskimos to prevent snow blindness.

Science News Letter, October 24, 1942

❁ **A PEN OR PENCIL CLIP** made entirely of plastic is the subject of a recent patent. Several kinds of plastic are now available, the inventor states, that are sufficiently springy to replace the metal clip entirely. Others will require reinforcement with a small strip of metal, which will also aid in fastening the clip to the pen cap.

Science News Letter, October 24, 1942

❁ **A BOTTLE CAP** that can be removed with the bare fingers, thus saving the annoyance of a lost opener, has recently been patented. The cap is made in two halves which lock together. A little tab which can be lifted by the fingers separates them and opens the bottle. This, however, is one of the conveniences for which we will have to wait until after the war.

Science News Letter, October 24, 1942

❁ **DEATH TO DISEASE** germs is administered by the luminous tubes seen



in the photograph. They stand guard at the entrance portal for the ventilating air of a war factory. Unseen ultraviolet rays which they emit, deal death to airborne bacteria.

Science News Letter, October 24, 1942

❁ **A CHILLING TANK** for bronze bushings illustrates one of the many ways in which refrigeration is helping to speed up war production. The castings are dipped in a 50-50 mixture of anti-freeze and water kept at 30 degrees below zero. This enables them to be machined soon after leaving the mold, avoids the long cooling process and several months of seasoning formerly required.

Science News Letter, October 24, 1942

If you want more information on the new things described here, send a three-cent stamp to Science News Letter, 1719 N. St., N. W., Washington, D. C., and ask for Gadget Bulletin 127.

MATHEMATICS

Amount of Oil in Sands Depends on the Grains

➤ **HOW MUCH** oil can an oil sand take up? This problem is of importance not only to the petroleum geologist but to the physicist, chemist and botanist.

The answer is given by Dr. Edward Kasner, professor of mathematics at Columbia University, in a report to the American Mathematical Society. If the grains are perfect spheres, all equal, he says, then for the closest packing

25.955% of the whole space will be vacant, and can be filled with oil or other liquid; while 74.055% will be occupied by the sand.

This mathematical result can be tested experimentally by filling a box with sand and then seeing how much water can be poured in.

The proportions of occupied and unoccupied space will be the same whether the spheres are large or small, provided they are all equal. But if they are unequal, (and suitably arranged) then a larger portion of the space can be occupied by the sand, and consequently less oil or water taken up.

This may easily be visualized if we pack a box with oranges. Between the oranges we might insert nuts, between these and the oranges we might get in some peas, and in the spaces still vacant fine shot, and so on until we get down to the finest powders. Thus we would fill up more and more of the space.

Mathematically this could go on forever—an infinite series of spheres of diminishing size. Practically we have to stop with the smallest particle that can be handled. Experiments with mixed sands have in fact succeeded in reducing the vacant space to a few percent.

It is obvious that spheres, however packed, will have small gaps and therefore space can never be filled 100%. But by a suitable arrangement we can fill 99% or 99.999% or as near 100% as desired. The work is purely mathematical since we are dealing with ideal perfect spheres. In a similar way the plane can be covered with circles (coins or discs of various sizes).

Science News Letter, October 24, 1942

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RODALE PRESS

• Books Just Off the Press •

AERIAL NAVIGATION—W. E. Dyer—*American Technical Society*, 64 p., 75c. Contains, in a pocket attached to the back cover, an "Air Navigation Slide Rule".

THE AIR WE LIVE IN (Air-Age Education Series)—George T. Renner and Hubert A. Bauer—*Macmillan*, 51 p., illus., 36c.

AIRCRAFT ENGINE TROUBLE SHOOTING CHART—arranged by Andrew Wallace—*Henley*, 75c.

AIRCRAFT SPOT AND SEAM WELDING—George Kuntz—*Pitman*, 108 p., \$1.25.

THE AMATEUR SCIENTIST—W. Stephen Thomas—*Norton*, 291 p., illus., \$3. "Science as a hobby".

THE AMERICAN ANNUAL OF PHOTOGRAPHY (vol. 57)—Frank R. Fraprie and Franklin I. Jordan, eds.—*American Photographic Pub. Co.*, 240 p., illus., \$1.50, paper; \$2.25, cloth. Beautiful photographs plus art by experts. Includes the Who's Who and a formulary.

AMERICAN TREES—by Russell T. Limbach—*Random*, 39 p., illus., \$1. Nice illustrations, some of which are in color.

AUSTRALIAN FRONTIER—Ernestine Hill—*Doubleday, Doran*, 332 p., illus., \$3.50. Not scientific, but because of its topical interest should prove popular.

BASIC MATHEMATICS—Walter W. Hart—*Heath*, 456 p., illus., \$1.52.

THE BIOLOGY OF FLIGHT, A Text for High School Students (Air-Age Education Series)—Frederick L. Fitzpatrick and Karl A. Stiles—*Macmillan*, 162 p., illus., 64c.

BIRDS OF NORTH CAROLINA—by T. Gilbert Pearson, C. S. Brimley—*North Carolina Dep't of Agr.*, 416 p., illus., \$3.50. Beautiful illustrations, some in color.

THE BOYS' BOOK OF COMMUNICATIONS—Raymond Francis Yates—*Harper*, 144 p., illus., \$2.

CHEMISTRY OF INSECTICIDES AND FUNGICIDES—Donald E. H. Frear—*Van Nostrand*, 300 p., illus., \$4.

CLIMATE MAKES THE MAN—Clarence Alonzo Mills—*Harper*, 320 p., \$3.

THE COMING BATTLE OF GERMANY—William B. Ziff—*Duell, Sloan & Pearce*, 280 p., \$2.50.

CRAFTS IN WARTIME—Marguerite Ickis—*National Recreation Ass'n.*, 22 p., 35c.

DOCTORS OF THE MIND—Marie Beynon Ray—*Little, Brown*, 335 p., \$3. A popular interpretation of the history of psychiatry. Scientifically unsound.

EAT WELL FOR LESS MONEY—Gaynor Maddox—*Dutton*, 219 p., \$2.

EDUCATION FOR THE AIR AGE: A Guide for Teachers and Administrators (Air-Age Education Series)—N. L. Engelhardt, Jr.—*Macmillan*, 55 p., 24c.

EDUCATION IN WARTIME—Porter Sargent—*Porter Sargent*, 224 p., \$1.50.

ELEMENTS FOR PRE-FLIGHT AERONAUTICS FOR HIGH SCHOOLS (Air-Age Education Series)—Aviation Education Research Group, Teachers College, Univ. of Nebraska—*Macmillan*, 556 p., illus., 96c.

THE ENGINEER'S SKETCH BOOK—Thomas Walter Barber—*Chemical Pub. Co.*, 355 p., illus., \$4.25. "Mechanical movements, devices, appliances, contrivances and details".

FIGHTING PLANES OF THE WORLD—Bernard A. Law—*Random*, 72 p., illus., \$1. New and revised edition.

FLYING HIGH (Air-Age Education Series)—Rose N. Cohen—*Macmillan*, 332 p., illus., 76c.

THE FLYING TIGERS—Russell Whelan—*Viking*, 224 p., \$2.50.

FOOD, A WEAPON FOR VICTORY—Bertram Baynes Fowler—*Little, Brown*, 185 p., \$1.50.

GEOGRAPHIC EDUCATION FOR THE AIR AGE: A Guide for Teachers and Administrators (Air-Age Education Series)—George T. Renner—*Macmillan*, 17 p., 20c.

GLOBES, MAPS, AND SKYWAYS (Air-Age Education Series)—Hubert A. Bauer—*Macmillan*, 75 p., illus., 40c.

HOW TO GET AHEAD IN A DEFENSE PLANT—Kenneth C. Hawthorne—*Crowell*, 270 p., illus., \$2.50. Pre-industrial training.

HUMAN GEOGRAPHY IN THE AIR AGE (Air-Age Education Series)—George T. Renner—*Macmillan*, 251 p., illus., 64c.

LABORATORY GEOMETRY—Elizabeth Roudesh—*Prentice-Hall*, 192 p., \$1.12.

MARKETING UNDER WAR CONDITIONS—Edgar H. Gault—*Univ. of Michigan, School of Business Adminis.*, 52 p., \$1.

MEET THE NATIVES—M. Walter Pesman—*Published by author*, 216 p., illus., \$1.25. "An easy way to recognize Rocky Mountain wildflowers, trees, and shrubs".

THE NATIONAL PAINT DICTIONARY (2nd ed.)—Jeffrey R. Stewart—*Stewart Research Laboratories*, 224 p., illus., \$7.50.

THE OCEANIC TINTINNOIA OF THE PLANKTON GATHERED DURING THE LAST CRUISE OF THE CARNEGIE—Arthur Shackleton Campbell—*Carnegie Institution*, 163 p., illus., \$2.50.

OHIO STREAM DRAINAGE AREAS AND FLOW DURATION TABLES—Claude H. Wall and C. V. Youngquist—*Ohio State Univ.*, 73 p., 75c.

OUR NEW ARMY—Marshall Andrews—*Little, Brown*, 225 p., \$1.50. Written by a staff-writer of the WASHINGTON POST.

OUTLINES OF ECONOMIC ZOOLOGY—Albert M. Reese—*Blakiston*, 359 p., illus., \$3.25. Fourth edition.

THE PRACTICAL ESSENTIALS OF PRE-TRAINING NAVIGATION—William T. Skilling and Robert S. Richardson—*Holt*, 113 p., 75c.

PRINCIPLES OF STRUCTURAL GEOLOGY—Charles Merrick Nevin—*Wiley*, 320 p., illus., \$3.50. Third edition.

THE SHIPS AND AIRCRAFT OF THE UNITED STATES FLEET—James C. Fahey—*Ships and Aircraft*, 64 p., illus., \$1. Photographs and data. Information not readily available to the enemy has been excluded.

SNOWBALL, ADVENTURES OF A YOUNG GORILLA—Osa Johnson—*Random*, \$1.50. Juvenile.

SOCIAL STUDIES FOR THE AIR AGE (Air-Age Education Series)—Hall Bartlett—*Macmillan*, 169 p., illus., 60c.

SOY BEAN RECIPES—Mildred Lager—*House of Better Living*, 43 p., 50c.

TEACHERS' MANUAL FOR THE BIOLOGY OF FLIGHT (Air-Age Education Series)—

Frederick L. Fitzpatrick and Karl A. Stiles—*Macmillan*, 27 p., 20c.

THRIFTY COOKING FOR WARTIME—Alice Winn-Smith—*Macmillan*, 147 p., \$1.50.

2,100 NEEDED INVENTIONS—Raymond F. Yates—*Wilfred Funk*, 252 p., \$2. A source book, with ideas classified under respective headings such as "Chemical", "Electrical", etc.

ULTRA-HIGH FREQUENCY TECHNIQUES—J. G. Brainerd—*Van Nostrand*, 534 p., illus., \$4.50.

UNLOCKING ADVENTURE—Charles Courtney—*Whittlesey*, 335 p., illus., \$2.50. An autobiography of a famous locksmith.

WILD ANIMALS OF THE ROCKIES—William Marshall Rush—*Harper*, 296 p., illus., \$3. A book, written by a ranger in the United States Forest Service, who believes Americans should be better informed about our game resources in order to properly conserve them.

WINGS FOR YOU (Air-Age Education Series)—E. A. Cross—*Macmillan*, 355 p., illus., 76c.

• First Glances •

➤ A FIRST volume in what will undoubtedly prove to be an invaluable reference book for systematic ornithologists is the *CATALOGUE OF BIRDS OF THE AMERICAS AND THE ADJACENT ISLANDS IN FIELD MUSEUM OF NATURAL HISTORY, (Part I, No. I.)* by Charles E. Hellmayer and Boardman Conover (*Field Museum of Natural History*, \$5.) This first section covers families from Rheidae to Columbidae.

Science News Letter, October 24, 1942

➤ AMATEUR SCIENCE plays a larger part in our communities than most of us have suspected. The American Philosophical Society's stimulating inquiry into scientific investigations not on the full-time professional level showed thousands of men and women who are experts even though they do their researchings as hobbies. W. Stephen Thomas' *THE AMATEUR SCIENTIST* (*Norton*, \$3) is the report of this pioneering investigation into adult amateur science activities. The large interest and wide participation in science as a hobby by boys and girls of high school ages is being developed through Science Clubs of America with an accent on preparation for war. Under war conditions much interest that would be devoted to hobby activities in science by older people may be diverted to added hours of war effort in regular tasks. When this stress is over, there should be a great development in amateur science for the sake of the persons participating, their communities and the world.

Science News Letter, October 24, 1942